Impact of Tax Automation on Subnational Domestic Revenue Mobilization and Development Financing in sub-Saharan Africa: Evidence from Nigeria's South-East Region

Nduka Vitalis Elda Okolo-Obasi[1] Cyprian Onyenekenwa Eneh[2] Chuke Emmanuel Nwude[3]

1. PhD candidate Instititute for Development Studies, University of Nigeria, Enugu Campus
2. Professor - Instititute for Development Studies, University of Nigeria, Enugu Campus
3. Associate Professor - Instititute for Development Studies, University of Nigeria, Enugu Campus

ABSTRACTS

This study assessed the effect of tax automation on total subnational domestic revenue mobilized in sub-saharan Africa and determined the impact of revenue change due to automation on development financing using evidence from south east region of Nigeria. Guided by benefit theory of taxation and technology acceptance model; we adopted quasi-experimental research design using secondary data covering from 2009 to 2021. The results from interrupted time series analysis using autoregressive integrated moving average indicate increase in total domestic revenue mobilized after automation. However, only about 38% of the increase was explained by automation. On the other hand, after deflating the data, the result shows that average value of revenues mobilised before automation have better capacity of financing development than average value of revenue mobilised after adoption of automation. This shows that the region needs to do more than adopting and using process automation to enlarge her tax effort and base. The study therefore, made recommendations, proffering practical solutions to automation and enlargement of subnational revenue collection in sub-saharan Africa.

Keywords: Automation, Domestic revenue mobilization, Tax, Sub-saharan Africa

Introduction/Background to the Study

Globally, tax as a compulsory charge imposed by a public authority on the income and properties of individuals and organisations (taxpayers) in accordance with predetermined criteria remains a major sources of domestic revenue to governments at all levels. Hence a key component of fiscal policy and administration in every economy is revenue collection because of its sway on government operations. According to UNECA (2016), mobilization and efficient usage of sufficient domestic revenue is the surest way to driving development financing and achieving the United Nations' sustainable development goals in sub-Saharan Africa (SSA) nations. In sub-Saharan African nations, deliberate and concerted efforts are being made to expand domestic revenue mobilization spaces and harness all available tax revenues. One of such efforts is automating the tax revenue collection process at both national and subnational levels (IMF, 2018).

Automation according to studies like Ayegba (2013), uses internet web-based digital information communication technology to control revenue process with the aim of accomplishing a workflow that makes tax assessment, tax payments, tax clearance certificate processing, and other information sharing more accessible, transparent, and cost effective among others. This automation as a reform process in most SSA nations have increased average tax to GDP ratio from an average of 11% in the 1990s to 15% in 2018 (Egwaikhide, 2019).

However, Nigeria, arguably the largest economy in SSA, well-endowed with natural and human resources, still has a very low tax to GDP ratio (about 5.6% compared to Mali 13.5, Burkinafaso, 15.3% or Lesetho 39.4%). Yet, according to Efobi, Beecroft, Belmondo (2019), a typical taxpayer in Nigeria experiences hydra headed multiple taxation. This low tax revenue mobilization even in the face of gamut oppurtunities has continued to obstruct the needed physical and social investment that would quicken the growth and development of the country.

Unfortunately, recent statistics show that, at subnational level, over 75% of the states mobilize less than 15% of their total revenue, hence the total dependence on monthly allocation from the federation account allocation committee (FAAC) for survival (NBS, 2021). Unluckily, the five states of south-east region fall into these states that are performing poorly in domestic revenue mobilization. This is why the various states are currently being confronted with huge development financing gap. According to Chiamaka, Obinna, Friday, and Oraekwuotu (2021), the domestic revenue mobilization in the states of the region compared to the need for spending is not only absurdly low, but the level of uncertainty is also very high. Regrettably, the federal revenue allocation accruing to the region is dwindling on quarterly basis coupled with a serious international development aid fatigue in the region. Obviously, there is a paucity of fund limiting the capacity of the states in attending to the needs of the citizenry in the region; yet the region is experiencing a serious population pressure and escalating urbanization (Uduji and Okolo-obasi, 2021).

Ironically, the region is blessed with some of the best potentials in both human and material resources; the populaces are predominantly engaged in real sector activities compared to the other regions, and the states have relatively good tax revenue opportunities, still, the region trail behind other regions not so blessed (Mbah and Onuora, 2018). Hence, studies like, Nwofia (2018), emphasize that, eliminating tax malpractices and closing revenue leakegaes is the surest of boosting domestic revenue mobilization and closing development financing gaps in the region. Several other scholars, (Okoye and Ezejiofor, 2014; Nkanor and Udu, 2016; Nwala and Gimba, 2019) among maintain that domestic revenue challenge in SSA nay nigeria and south-east region is multifaceted and have defiled every effort made to improve domestic revenue output in the past. This failure moved countless stakeholders to recommend automating the revenue process as a panacea to the numerous revenue system ills.

Automation proponents believe it will improve the total domestic revenue mobilized by blocking the leakages and boosting the turnaround time. Bring more taxpayers into the tax net, lower both enforcement and compliance cost, increase productivity and efficiency of the tax workers, minimize multiple taxation, and increase transparency in the revenue process (Ofurum, Amaefule and Amaefule, 2018). With these promises, the various states in the region invested meaningfully in both human and material resources to ensure the successful implementation of automated revenue system in their states. In all this, revenues of the various states in the region appears to still remain disapprovingly low and little or no physical development are really taking place. Hence, the impact of tax automation on domestic revenue outcome of the region is still very unclear and a subject under serious contention.

While on one hand, the proponents like John-Akamelu and Iyidiobi (2019) and others, argue that adoption of automation reduced tax malpractice and significantly increased voluntary tax registration and quantity of domestic revenue mobilized; others like Nnubia et al (2019), argue that, automation has not positively and significantly improved the domestic revenue outcomes, rather the complexity of the technology has demotivated many taxpayers and even increased the activities of rogue tax collectors. Scholars in the middle like, Onuselogu and Onuora (2021) insist that, automation has created neither positive nor negative effect because of poor understanding and perception of the technology by taxpayers and handling by tax administrators. To the best of our knowledge, little or no empirical evidence has shown a comprehensive effect of tax automation process on the revenue outcome of the South-East as a region and its implication on the financing development of the region. It is on this bassis that we embarked on this study with the objective of evaluating the effects of tax automation process on domestic revenue mobilization outcome of the South-East region of Nigeria. The study specifically asked and attempted to provide answers to the following research questions.

- Does tax automation have any effect on total domestic revenue mobilization of South-East States?
- What is the implication of the revenue changes due to automation on financing development in the region?

1.1 Study Hypothesis

With the recommendations of academia and policymakers, subnational governments of the south-east region have made thoughtful efforts to boost their domestic revenue through more inclusive and taxpayer-friendly strategies to guarantee their survival, yet Chiamaka et al (2021) among others others still assert that, regardless of the ongoing tax reform, tax intake when compared to their potentials is yet very far below expectation. To policymakers, the region still need to increase her tax intake by over 50% of the current level if she will meet up with financing her development need. Thus, we hypothesize that:

- Tax automation have not made any significant impact on domestic revenue mobilized and development financing in South-East States.

2.0 Literature Review

Two major concepts need clarification in this study, on one hand is the concept of revenue, and the concept of automation on the other hand.

2.1.1 Revenue

This study takes **revenue** to be the total fund that accrues to a government and is required by such government to finance its activities within a specified period of time; it does not include borrowing and recovery of loans from other parties. Tax, according to Pricewater House Cooper (2021) is a major part of government revenue, a compulsory and non-refundable monetary charge imposed on persons, an entities, transactions, or properties by a constituted government authority charged with raising revenue for the government. In the context of this study, state domestic revenue is the total fund that a state can generate within its economy and is required by the state government to finance its activities within a specified period (Etim, Mfon and Patrick, 2020). In this study, the state revenues were measured quarterly and for easy of comparison among states and availability of data, we adopted the NBS classification of state domestic revenue as, pay as you earn (PAYE), road taxes, direct assessment, other taxes and MDA revenues.

The quality and quantity of revenue generated by a society holds the key to her achieving the Sustainable Development Goals (UNECA, 2016; IMF, 2018). The amount of revenue a society can generate defines the society's standard of infrastructural facilities quality of human capital development and financing of other development plans and projects.

2.1.2 Automation according to Wisdom, Ajayi, Akindayo, Yanah, Kwaido, and Shehu (2020), is the use of control systems like programmable logic control, numerical control, and other industrial systems together with applications of computer aided technologies such as computer aided design (CAD), computer aided manufacturing (CAM) to control machinery and processes thereby reducing the need for human intervention. Simply put, Gupta, Mulas-Granados, Liu, Salman and Ross (2020) comprehensively captured the concept as a process of taxpayers using tax processing software that has been pre-approved by relevant tax authorities to process dealings over the internet and the design of the software varies with the taxable income of the taxable entity. Such software is designed with specification by the appropriate tax authority regarding the nature of taxpayers and the taxes they deal with. In all automation uses internet web-based digital or information communication technology to control the whole tax process and enables the taxpayer to file returns, make payments, process clearance certificate and monitor their profiles online. Every government is desirous of collecting more tax revenue to increase socio-economic spending, but a responsible government has to comply with best practices of economic efficiency, equity, convenience, certainty, and ability to pay (Awai and Oboh 2020).

2.2 Conceptual Framework

In Figure 1 below shows, studies suggested that automation of tax revenue is expected to lead to greater participation of both taxpayers and tax administrator in the revenue process. This will lead an enlarged and motivated taxpayer base. Scholars like Adegbie and Akinyemi (2020) opine that, a greater participation of motivated taxpayers leads to enhanced revenue base and improvement in the amount generated from taxation. If revenue is enhanced, governments can propose, embark on, and finish more developmental projects. This motivates taxpayers based more on benefit theory of taxation, hence more commitment and voluntary compliance leading to predictable or near certainty of revenue quantity to be generated by the government. For this, all revenue generated are pocketed by the governments.

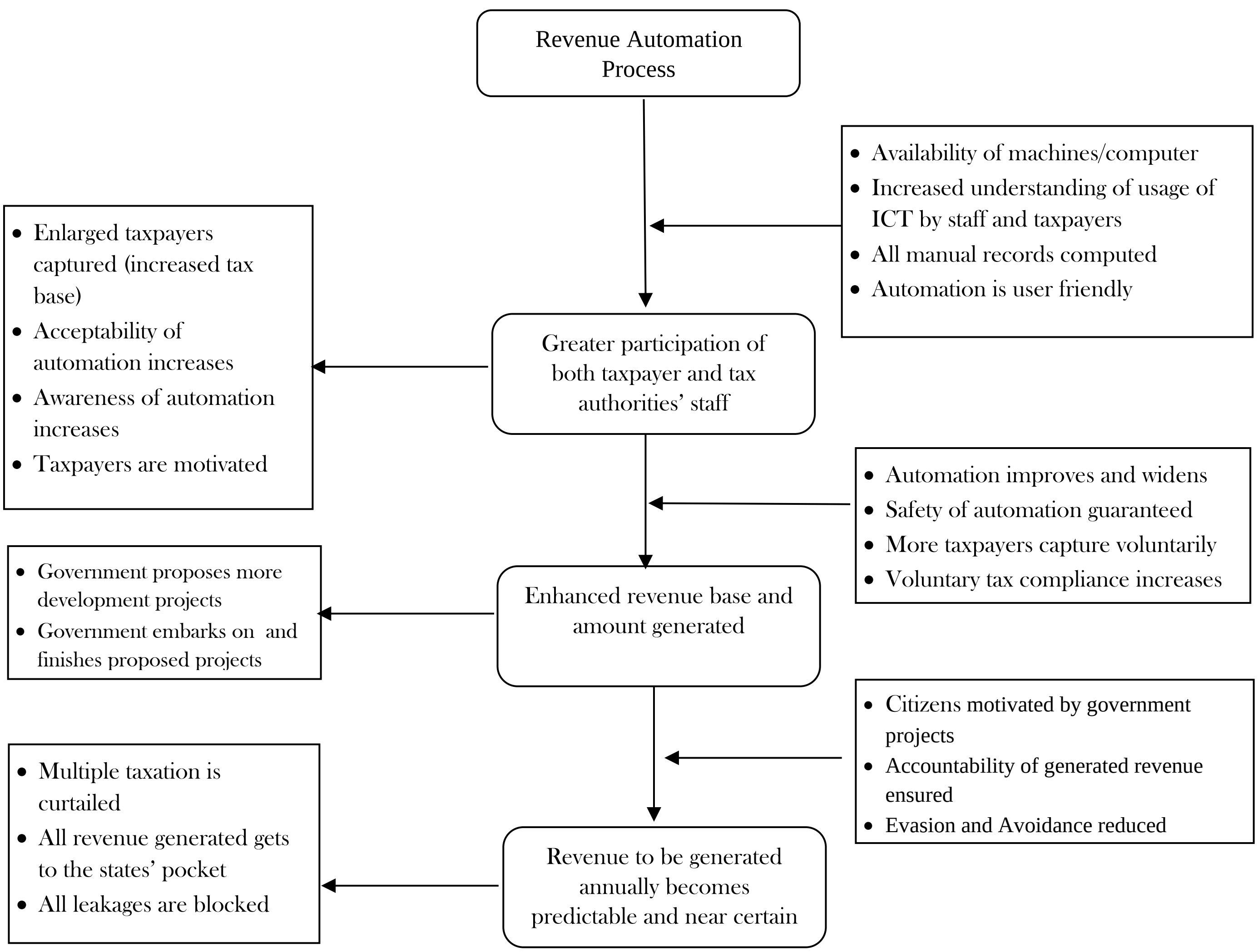

Figure 1. Conceptual Framework of Tax Automation and Domestic Revenue Mobilisation
Source: Developed by the author

In Nigeria, tax automation software for taxes collectable by federal government is designed and developed by the Federal Inland Revenue Services (FIRS) while at sub national levels, taxes payable to states are collected through the software developed by respective States Boards of Internal Revenues (SBIRs) of the 36 states (Dang and Dashe, 2018) . This also applies to local government's revenue committee as they collect taxes payable to local governments with their own software (Ibeogu, and Ulo, 2015; FIRS, 2020) To Irefe-Esema and Akinmade (2020), tax automation, though relatively young has been adopted in all classes of countries ranging from the developing, emerging and developed economies.

Toluwanimi (2019) and Oladele et al (2020) observed that, the TIN was developed to create closer linkage between the national tax authority, the Federal Inland Revenue Service (FIRS) and the 36 State Boards of Internal Revenue (SBIR) so as to aid corporation, information sharing, reduce double taxation and increase revenue generation across the various authorities. The JTB has the responsibility of ensuring collaboration in the issuance and administration of TIN to all taxable entities. This TIN is a part of an automated national platform for effective tax administration process through the ITAS.

ITAS was introduced by the FIRS in 2013 to reduce the need for physical interaction between the taxpayer and the tax administrators (Ezugwu and Agbaji, 2014; Olaoye and Atilola, 2019). Since the year 2015, all the states of the South-East region of Nigeria, have adopted, created, and issued TIN to their taxpayers (Okeke, Mba and Eme, 2018; Nwamgbebu et al, 2019)

The automated system developed by each of these states according to Nnubia et al (2019), is supposed to enables taxpayers use the integrated tax administration system (ITAS) to access tax services which includes: filling returns online, paying tax online on the platform from taxpayers' bank accounts with the help of Nigeria inter-bank settlement system (NIBSS), Interswitch and or Remita hosted on the respective commercial bank's internet-banking platform.

2.3 Theoretical Review

This study adopted ability to pay theory (APT), benefit theory of taxation (BTT) technology acceptance model (TAM) as the theoretical basis of this study.

2.3.1 Ability-to-Pay Theory (APT)

The theory is a bit like the theory of equity. It is a theory that was propounded by Adam Smith in 1776 in his book wealth. The theory has been discussed extensively by scholarly works like Musgrave and Musgrave (1989) with emphasis that taxation burden will be lightened if the method of sharing it among the citizens of a particular community is justiciable and is anchored on equity. APT argues that citizens should get tax liability as a contribution to their government for the provisions of public good and services they enjoy from the government. To Abata, and Akinola (2020), such tax liabilities should be on progressive basis according to the entity (taxpayer)'s ability to pay. APT takes tax liability as an unavoidable payment to the state without any quid pro quo. It is supported by socialist thinkers because it is purely and simply based on principle of equity and justice.

2.3.2 The Benefit Theory of Taxation (BTT)

BTT evaluate tax burdens according to benefits taxpayers received from the state (Musgrave and Musgrave, 1989). The fundamental impression is that of reciprocity which entails a fair taxation to means where taxes payed by taxpayers is positively related to benefits they receive from the state. For

Bird (2011), BTT is agreeable to two strong interpretations, from both the classical and the modern versions. While the classical version holds that, taxpayers should pay taxes in proportion of benefits they receive, the modern version holds that taxpayes should receive benefits sufficient to compensate for the tax sacrifices they make. To Ajetunmobi et al (2022), BTT has a number of advantages in that, in the area of ethical claim, it appeals to intuitive principles of fair cooperation and as a rule of procedural justice, it tends to protect against oppressive tax schemes as well as against more mundane wasteful spending. Adam (1904), noted that both the BTT and the APT would therefore count as progressive when compared with the status quo and promise to produce a fairer distribution of burdens among taxpayers of similar economic station.

2.3.3 Technology Acceptance Model (TAM)

TAM was propounded by Davies in 1989 from two social psychology theories; the theory of reasoned action (TRA) and the theory of planned behaviour (TPB). TAM postulate that, what determines an adopter's usage of a new technology is anchored on perceived usefulness of a technology and the pecieved ease of use of such technology (Offurum et al, 2018). Also, the degree to which the potential user expects the freedom of effort in the targeted system with the expectation that the system will help to increase the degree of efficiency and effectiveness of performance plays a major role in using information technology (IT). TAM when applied within and or across a setup of an organization is very helpful in assessing technology applications and making comparisons (Ajala and Adegbie, 2020).

To account for how taxpayers adopted automation in expectation of the benefit they will recieve from tax payment based on their ability to pay, we adopted the TAM as part of theories underpinning this study.

2.4 Empirical review.

We carried out a broad reviewe of automation and tax revenue mobilization literature starting from the pre automation years to current years. In the pre automation years, many scholars believed that well-applied, user-friendly tax automation certainly will improve revenue generation by reducing tax malpractices. Such studies are represented by Ayegba (2013), Okoye and Ezejiofor (2014) among others. However, some early Nigerian studies, (Alade, 2018; Olaoye and Atilola; Ofurum et al., 2018; Nnubia et al, 2019) among others that reviewed the automation after some years of implementation emphatically asserted that, tax automation has not significantly spur revenue generation. Yet, on the other hand, John-Akamelu and Iyidiobi (2019), Nwamgbebu et al (2019), Akinleye et al (2019), Olaoye and Atilola (2019), asserted with their studies that automation has improved domestic revenue generation in Nigeria.

In other studies at the beginning of this decade, scholars like Abata and Akinola (2020) and Etim, et al (2020) still insist that automation has not contributed decidedly to revenue generation in Nigeria. Irefe-Esema and Akinmade (2020) supported this with their assertion that the system is good and has capacity, but usage complexity reduced the expected impact. Even Adegbie and Akinyemi (2020), argued that high level of corrupt practices is prevalent in the electronic payment and revenue generating system of the government agencies. Others like Chiamaka et al (2021) Adah and Obera, (2022), Ajetunmobi et al (2022) Atagboro and Ekpulu (2022) while adoring the potentals of automation still emphasized that at the time of their assessment, automation has not made the needed impact on revenue management.

Adding their voice to the debate, Onuselogu and Onuora (2021) agreed that automation has made neither positive nor negative impact on revenue generation. Other recent studies like Okoye and Adesanya, (2021), Otekunrin et al, (2021), Adegbie et al (2022), Ine-Tonbarapa et al (2022), Ihenyen, et al (2022) insists that, though it may not be perfect, but automation has caused revenue revolution in the length and breadth of Nigeria. The argument goes on and more assessment like ours are ongoing.

While our study believes in increase in the volume of domestic revenue the states can mobilize, we noted that the literature appears to be silent on the implication of the outcome revenue changes on development financing. Most studies have ended their findings based on the use of norminal data but none to the best of our knowledge has used deflated data to find out the exact implication of the revenue change on development.

3.0 Material and Methods

3.1 Area of Study

The study was conducted in South-East geopolitical region of Nigeria in sub-Sharan Africa; a region made up of five states which include, Abia, Anambra, Ebonyi, Enugu and Imo States. With an economically active population (18 – 65 years of age) of about 8,832,108 persons, the population density is about 744 people per Km^2 (NPC, 2019; NBS, 2021).

3.2 Research Design

In this study, we adopted explanatory research designs with an inbuilt quasi – experiment to account for two periods (pre-automation and post automation) under consideration. In explanatory research design, observation of the influence of the explanatory variables on the dependent variable establishes a relation between the cause and effect of a happening. We investigated the relationship between automation and revenue outcome.

3.3 Data for the Study

The study used both primary and secondary data. To achieve objective one, we used secondary data sourced from the publications of the various states Internal Revenues, and the National Bureau of Statistics (NBS). Also, in answering research question 2, we added data, primarily generated from respondents in key informant interviews with selected tax stakeholders.

3.4 Methods of Data Analysis

In evaluating the effect of tax process automation on domestic revenue mobilization in the states of the region, both descriptive and inferential statistics were used to achieve the objectives of the study, answer research questions and test the hypotheses. Objective one was achieved using interrupted time series analysis (ITSA). ITSA enables comparisons of population-wide intervention outcome before, during and after such intervention. It is different from other simple "before and after" studies because of its strength in analysis of trends and ability to differentiate the effect of an intervention from that of the underlying trend as well as its ability to estimate the counterfactual. We used only one group in the study (no comparison groups), while adopted with modification, the standard ITSA regression model proposed by Linden and Adams (2015) which is stated as follows:

$$Y_t = \beta_0 + \beta_1 T_t + \beta_2 X_t + \beta_3 X_t T_t + \varepsilon_t$$

This model was modified to represent our variables of interest stated as Follow:

$$Revenue = \beta_0 + \beta_1 Time_t + \beta_2 Automation_t + \beta_3 PostAutomation_t \; X \; Time_t + \varepsilon_t \quad \textit{Equn. 3.4}$$

Where,

Y_t = aggregated outcome variable (amount of domestic revenue mobilized) measured at each each quarter of the year.

T_t = time since the start of the study period (Q12009 – Q22021),

X_t = a dummy (indicator) variable representing the intervention - automation (pre-automation periods= 0, otherwise 1), and

$X_t T_t$ =an interaction term indicating the time that has elapsed since the automation began.

β_0 = the intercept or starting level of the outcome variable.

β_1 = the slope or trajectory of the outcome variable until the introduction of the intervention.

β_2 = the change in the level of the outcome that occurs in the period immediately following the introduction of the intervention (compared with the counterfactual).

β_3 = the difference between pre-intervention and post-intervention slopes of the outcome. Thus, we look for significant *p*-values in β_2 to indicate an immediate treatment effect, or in β_3 to indicate a treatment effect over time.

We analysed the ITSA using autoregressive intergreted moving acaerage (ARIMA) because ARIMA forecasts the outcome (Y_t) in the absence of the intervention (the "counterfactual") and determines how the observed deviates from this forecast and the extent the deviation is caused by the intervention under review.

For objective two, we combined both quantitative and qualitative methods to answer the question. Using deflated data, we ran descriptive statistics for comparison of the ability of average quarterly revenue to fund development project between the two periods. Also, information collected from the key informant interviews were used to either confirm or dispute the findings.

4.0 Results and Discussion

4.1 Automation and Total Domestic Revenue in the Region – Descriptive Statistics

Revenue Centre	States	Pre-Intervention	Post Intervention	Difference	% Change
Total Domestic Revenue	Abia	3,020.66	3,810.59	789.93	26.15
	Anambra	2,267.97	4,982.69	2,714.72	119.70
	Ebonyi	2,484.34	2,248.89	-235.45	-9.48
	Enugu	3,319.98	5,845.82	2,525.84	76.08
	Imo	1,581.80	3,242.19	1,660.39	104.97
	South-East	12,961.36	19,738.67	6777.31	52.29

Analysis (Table 1) shows difference in average quarterly domestic revenue in the region between the pre/post-automation periods. The pre-automation period recorded average quarterly total domestic revenue of about NGN12.9 billion while the post-automation period records about NGN 19.7 billion. This shows that average quarterly total domestic revenue improved by approximately NGN6.7 billion (about 52% increase). While Abia, Anambra, Enugu and Imo states increased by about 26.15%, 120%, 76%, and 105%, respectively, only Ebonyi state decreased by about 9.5%. Further decomposition of this result shows that, PAYE increased by about 53%, direct assessment, 21.3%, road taxes 22.7%, other taxes 61.8%, and MDA revenue 83.4%.

This preliminary result tends to agree with scholars like Okoye and Ezejiofor (2014) that the panacea to all subnational revenue problems is automation of internal revenue process. The decrease in ebonyi state aligns with Nkanor and Udu (2016) in that the relationship between e-revenue generation and infrastructural development is Ebonyi state is negative and hiamaka et al (2021) in their assertion that electroautomation does not statistically affect the internally generated revenue of Ebony state.

4.2 Automation and Total Domestic Revenue in the Region – Inferential Statistics

To control for auto-correlation, non-stationary, and seasonality associated with time series, we estimated changes in level and trend using ARIMA model. Analysis (Table 2) presents the result thus.

Table 2: Parameter Estimate for Total Domestic Revenue of South-East Region.

Total Domestic Revenue	Co-efficient	S.E.	t-statistics	P-value	RE%
FIT Test	R^2= 0. 963; LJung-Box Q (18) = 16.117 (p = 0.516; d.f =17)				
Intercept β_0	10543.38	0.0748	62.54	0.0001**	
Baseline trend β_1	0.0046	0.0305	.0512	0.0641	
Level change after automation β_2	0.0019	0.982	0.317	0.1753	
Trend change after automation β_3	0.0141	1.012			
Level of effect					
Quarter 2 after intervention	-21.35 (0.20%)	6.047	3.898	0.211	6
Quarter 12 after intervention	3052.44 (29%)	8.270	3.011	0.001**	19
Quarter 22 after intervention	12548.01(56%)	15.02	1.983	0.050**	32

** = level of significance at 5% and 90% Confidence Interval; *=Level of significance at 10% and 90% Confidence Interval

Sources: Authors Computation.

The pre automation baseline trend was insignificant showing no significant quarter-to-quarter change in the average quarterly TDR mobilized. Also, the immediate effect after the automation shows that the change in level of revenue generated was insignificant with no significant change in the quarter-to-quarter trend of the average TDR mobilized. The implication is that few quarters after the introduction of automation, the change in total revenue mobilized was insignificant. The variation between TDR mobilization and the counterfactuals reduced by only about 0.20% of the value of the counterfactuals, but, only 6% of this reduction was explained by the introduction of automation.

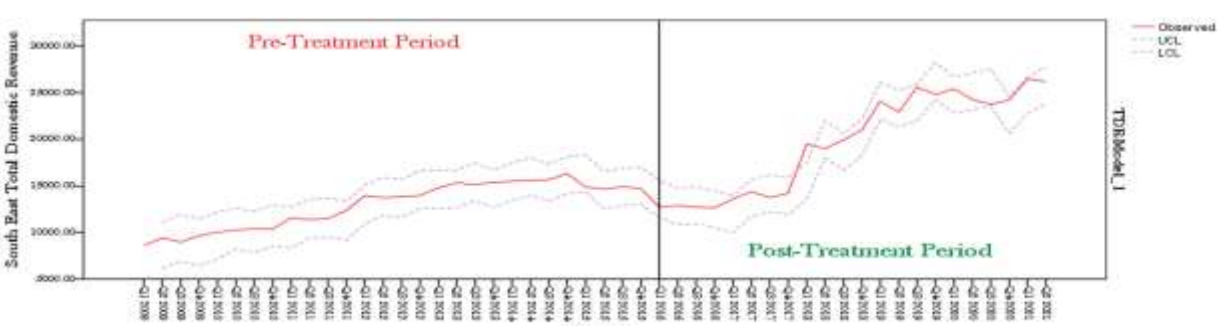

Figure 2: Level and Trend of TDR Mobilization pre and post automation in South-East Region.

Sources: Authors Computation.

Any study that stopped at this level would have concluded that automation has no significant effect on total domestic revenue mobilized. However, the intermediate and long-term effect proves otherwise with the intermediate showing significant increase in the quarter-to-quarter trend of the average TDR with P-value of 001, the TDR increased from the counterfactual to the mobilized by about 19% and about 25% of the change was explained by automation. At long run, the variance in revenue shows about 56% increase from the counterfactual with about 40% of the change explained by automation.

The implication of this finding is that, though automation may not have made immediate impact on TDR in region, it have eventually generated largely significant effects on the TDR of the region as the usage progressed. This significant effect authenticates the position of Okafor (2012) who opines that, well and consistently applied automation will certainly improve revenue generation of the states nay the region. It also aligned with Nwamgbebu et al, (2019) who posited that, automation solves the problem of low tax collection. However, the result does not agree scholars like Abata and Akinola (2020) who mantains that automation has not made the expected impact on revenue generation in Nigeria.

Looking at the effect on each state's TDR, the immediate effect after implementation of automation in Abia state shows that the change in level of revenue generated was not significant. The variance in revenue between the actual and the counterfactual was a reduction of about 0.9% in the immediate effect, about 4% increase in the intermediate effect and finally about 10% increase in the long run effect. This shows and increasing trend meaning that, if more time is given to the process and all the necessary provisions made, automation will revive the state revenue system. The findings aligned with Onodugo et al (2015), to assert that, improving domestic revenue mobilization in Abia state in particular and south east in general requires drastic investment in the automation process.

In Anambra state, though the change in revenue was low and negative from the beginning, at the long run there was a tremendous improvement to show a higher impact of about 44% increase. However, when compared to Enugu, one thing that comes clear is that the average revenue of Anambra before automation was very low. This low domestic revenue some of the respondents attributed to draconic way of enforcement. No matter what, the findings of this study confirms the assertion of John-Akamelu and Iyidiobi (2019) that automation has improved the revenue performance of the state of Anambra and have handled several revenue ills.

On the part of Enugu, the nominal data shows that, it appears Enugu has done well with automation. Like Anambra, the starting point was not positive, but from the intermediate assessment, the revenue performance improved with automation have the revenue changed by about 19%. This simply means that if automation were not embarked upon, such 19% increase on the counterfactual would have been lost. However, to be noted is that only about 22% of the increase was caused by automation. This is a serious indication that there may be many other factor at play that worked with automation to improve the state revenue. However, from the result of this study, we still concur with Okoye and Ezejiofor (2014)' conclusions that automation has the capacity to turn around the state revenue.

Imo state recorded a big leap up to about 49% change between the counterfactual and the mobilized revenue. However, because the revenue generation process before automation was very low and volatile, the increase became highly obvious. That notwithstanding, the fact that about 28% of the increase was explained by automation, it leaves one to conclude that automation has made significant impact in the total domestic revenue mobilization of Imo state. The only state that registered a negative out come at the immediate and the long run assessment is Ebonyi state. The findings of this study shows that, automation seem not to have helped the Ebony state revenue process. Our finding confirms Chiamaka et al (2021) that automation has not yielded the desired results. However, our study cannot allude to the fact that automation cannot help Ebonyi state revenue process, but believe that the state has some lesson to learn from the other south east state who appears to have done better in their own implementation of the automation policy.

4.3 The Implications of Revenue Changes due to Automation on Financing Development in the Region

Having seen that there was an increase in the volume of revenue generated after implementing automation, this study becomes more worried about the implication of this increase on funding developmental projects in the region. This is because even in this times of more revenues, social infrastructures and other goods and services appears to be more dilapidated. Hence to ascertain the real value of the increase, we deflated the nominal data to be able to assess how effective the change can go in financing development

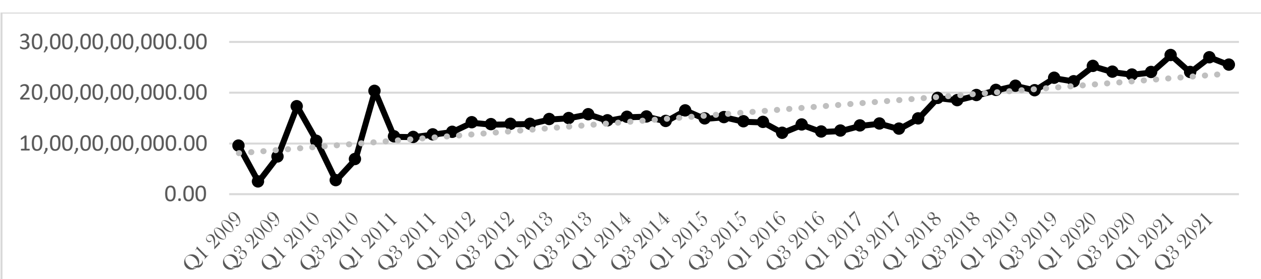

Figure 3. Trend of change in Nominal value of total domestic revenue mobilized and its Implications on Development of the Region.

Sources: Authors Computation.

Analysis (Figure 3 and 4) shows that, nominally, there is an upward trend of positive changes in amount of revenue mobilized after introduction of automation. However, deflation of the data shows a downward negative trend. This simply shows that, no doubt, the change in quantity of revenue mobilized after automation has a significant positive value with the nominal data used. However, the real value of the data speaks to the fact that what the change can afford in financing development amounts to little or nothing.

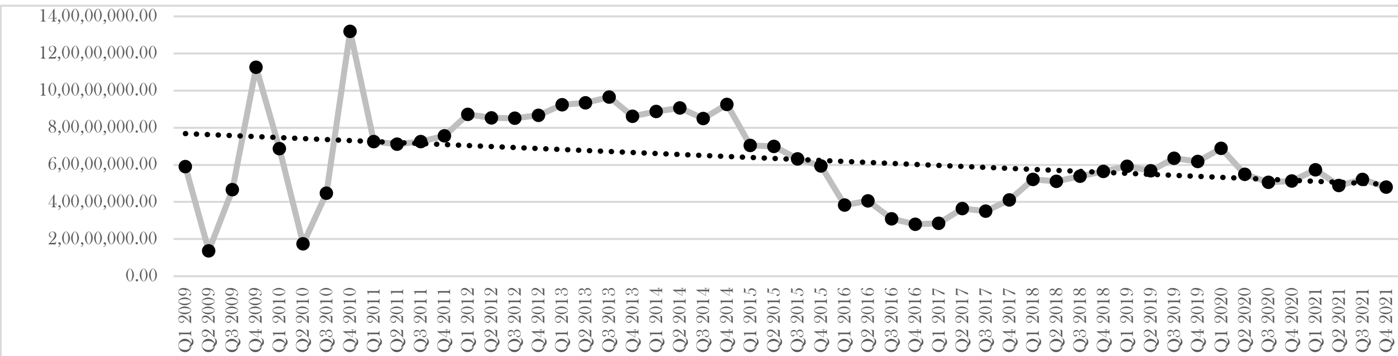

Figure 4 Analysis of Change in Real Value of Total Domestic Revenue Mobilized and its Implications on Development of the Region.
Sources: Authors Computation.

From the foregoing, it became very vital to know that, even while the region is seeking a process the will enhance the quantity of revenue generated, it is of utmost important to deliberately think of what will enhance quality of the revenue. The key informant opinions almost unianimously agree with Agu (2010, 2011), whose advocacy is for closer interaction between the region's government and the private sector so as to jointly develop industries that will form the base for mobilizing more internal revenue.

The trend line on the Figures 4 and 5, shows that the region does not only need to improve the quantity of her domestic revenue but must improve it in a way that the variation in exchange rate and the inconsistence in inflation will not catch up with it. To most respondents, increasing tax rates maybe useful, but would only amount to milking the same set of cows that are already over-milked. Simply put by key informant in Ebonyi state opined that:

> *Whenever the state government talks about broadening the tax base, all they do is to introduce new taxes by inventing new names so as to collect more revenue from the same old taxpayers, thereby causing more blow to same set of people who are already bleeding cripplingly from cuts inflicted on them by an arbitrary multiple tax system.*

While this study may have added a nuance to the fact that automation improves efficiency of revenue mobilization, the study still believes strongly that there is an urgent need to move away from conventional measures as governments strive to improve internally generated revenue in the region.

The states must have to exploit the unexploited sectors by development of the revenue yielding sectors of the MDAs for revenue upshot in the various states. If the yield of available sectors are not increased and hitherto unexploited sectors are explored, improving the domestic revenue of the region may remain a mirage. The states have to provide adequate support to the private sectors because according to key informants especially the market leaders, the optimal performance of the private sector is seriously affected by phenomenal infrastructural decay and policy neglect. In line with the benefit theory of taxation, as taxpayer see no benefit of taxes they pay, tax avoidance becones inevitable while government lack moral justification for enforcement. Therefors, investing in physical and social infrastructure that supports private enterprise; not for government to go into business but for government to partner with private entrepreneurs will enhance revenue base of the states.

For instance, a key informant opined that:

> *Nothing stops the five states in the region to pool resources and exploit economies of scale to design programmes that will energize the region's economy. Such programmes like, providing power and internet facilities for designated industrial zones as well as streamlining measures to avoid double or multiple taxation on firms within the region.*

The states must improve the accountability of collected funds, this is why fiscal overhaul as regards strengthening the institutional capacity for accountability becomes a necessary call if the trust of the private sector on government must be nurtured back. This supports the calls of scholars like John-Akamelu and Iyidiobi (2019), Nwamgbebu et al (2019), Nnubia, et al (2020) whose calls were based on their findings that the region has a big asset in her people which has been widely acknowledged as resourceful. But regrettably, the resourcefulness is yet to be tapped into for full economic turn-around.

In all, the increase we have seen so far is not yet the increase required to properly fund the development of the region. Therefore, much work is needed to be done to expand the tax base and ensure that every taxable entity contributes according to their ability-to-pay, while also enjoying the benefits that is commensurate with the sacrifices made, this is where the automated system plays a key role. And that is the major if not the only way the region can increase her current tax intake by up to 50% to meet up with the development funding recommendations.

5.0 Conclusions and policy Implications

Generally, this study noted that though automation did not make immediate significant effect on total domestic revenue mobilization of the south-east region, it has progressively made positive significant effect in quantity of revenue mobilized. However, because the positive effect is overshadowed by inflation in the economy, the implication is that, the increase was not enough to fund development. Hence, much more thinking and hard work other than automation are needed to be done in the states to boost the domestic revenue. In doing this and carefully handling of the numerous challenges confronting the automation process in the region, domestic revenue mobilization for development financing will be greatly enhanced.

5.1 Recommendations:

This study therefore on the basis of the findings recommends that, the various government should as a matter of urgency automate all the government revenue centres without exeption, instill and maintan coordination among the MDAs to ensure all leakages are blocked. Finally, there is a serious need for closer interaction between the region's governments and the private sector so as to jointly develop industries that will form the base for mobilizing more domestic revenue. For sure, this may sound strange but, it is an actual fact; the answer to sustainable development financing in the region does not lie in 'better' sharing of federal allocation (national cake). The south-east share of the national *cake,* no matter how equitably it is shared, will still be far from being sufficient for financing the growing needs of the region. Hence, domestic revenue mobilization remains pivotal to whatever the region can do.

5.2 Suggestions for Future Research

Further studies should be carried out to evaluate the tax capacity and effort of the various states so as to identify further areas of resources that has not been tapped in the region. Further studies should be done also to assess the impact of automation on the revenue expenditure on public goods and services.

REFERENCES

Abata, M. A., and Akinola, O. (2020). Effect of Electronic Tax System Adoption on Tax Compliance and Users' Satisfaction in Lagos State, Nigeria. *Journal of Policy and Development Studies,12* (2), 86-92

Adah, A., and Obera, J.J.O. (2022). Reviewing Tax Collection in the Electronic Tax Regime in Nigeria. *Journal of Contemporary Issues in Accounting* 3(1) 217-230

Adebayo, A. A., and Idowu, A.B. (2020). E-taxation and revenue generation effectiveness in developing economy: A case of Nigeria. *International Journal of Scientific and Engineering Research, 11*(9), 1000-1012.

Adefolake A.O., and Omodero, C.O. (2022). Tax Revenue and Economic Growth in Nigeria. *Cogent Business & Management,* 9:1, 2115282, DOI: 10.1080/23311975.2022.2115282

Adegbie, F. F., Enerson, J. and Olaoye, S.A. (2022). An Empirical Investigation into the Relationship between Electronic Tax Management System and Tax Revenue Collection Efficiency in Selected States in Southwest, Nigeria. *International Journal of Accounting Research 7*(1), 43-53

Adeyeye, G. B. (2019). Improving Tax Administration through Technology Innovation in Nigeria: A Study of Federal Inland Revenue Service. *Annals of Spiru Haret University. Economic Series, 19*(1), 31-63.

Ajala M.O.O. and Adegbie F. F. (2020). Effects of information technology on effective tax assessment in Nigeria. *Journal of Accounting and Taxation, 12*(4), 126-134

Ajayi, E. O., and Oyeniyi, Y. (2021). Impact of E -Tax Filing on Tax Revenue Generation in Nigeria. *Global Journal of Accounting 7*(1), 25-36

Ajetunmobi, O., Ojeka S., Fakile, S., Olokoyo, F., Osuma, G., and Eluyela, D. (2022). Tax Reforms, Digitalisation and Government Revenue in Nigeria. *International Journal of Economics and Management Systems 3* (7), 281-299.

Atagboro, E and Ekpulu, G.A. (2022). Electronic-Tax System and Revenue Generation Efficiency in Bayelsa State Internal Revenue Board. *Journal of Accounting and Financial Management 8*(6), 44-56

Awai E. S. and Oboh T. (2020). Ease of Paying Taxes: The Electronic Tax System in Nigeria. *Accounting and Taxation Review, 4*(1) 63-73.

Bird, R.M. (2011). Subnational Taxation in Developing Countries: A Review of the Literature *Journal of International Commerce, Economics and Policy* 2(1) 1–23

Chiamaka, E. O., Obinna, P. N., Friday, N. E., and Oraekwuotu, C. N. (2021). Electronic Tax System and Internally Generated Revenue in the Nigerian Emerging Economy: The Study of Ebonyi State Board of Internal Revenue. *International Journal of Academic Research in Accounting Finance and Management Sciences, 11*(2), 123-149.

Efobi, U., Beecroft, I., and Belmondo, T. (2019). Small Business Use of the Integrated Tax Administration System in Nigeria ICTD African Tax Administration working Paper 8

Egwaikhide, F O., (2019). Nigeria's Low Tax Collection and Poor Quality of Government Expenditure: Political and Administrative Impediments to Improvement. CGD Policy Paper 162. Washington, DC.

Etim, R.S., Mfon, S. J., and Patrick B. S. D. (2020). Tax Compliance and Digitalization of Nigerian Economy: The Empirical Review *American International Journal of Social Science 9*(2),42-50

Fakile, A.S., Adegbie, F.F., and Faboyede, O.S. (2014). Mobilizing Domestic Revenue for Sustainable Development in Africa. *European Journal of Accounting Auditing and Finance Research, 2*(2), 91-108

Federal Inland Revenue Service (2020). *FIRS.* [online] Available at: <https://www.firs.gov.ng/e-Services/e-Filing) (Accessed 12 April 2021)

Gupta, S., Mulas-Granados, C., Liu, J., Salman, D., & Ross, K. (2020). Institutional and Political Determinants of Statutory Tax Rates: Empirical Evidence from Sub-Saharan Africa. CGD Policy Paper 191. Washington, DC: Center for Global Development.

Ibeogu, A.S., and Ulo, F.U. (2015). Internally Generated Revenue in the Local Government System and Sustainable Community Development in Nigeria: A Study of Abakaliki Local Government Area Ebonyi State. *International Journal of Research in Business Management, 3*(11), 111-120

Ihenyen, C. J., Buseri, T., and Okoro, O. L. (2022). Information Technology Application and Effective Tax Administration in Bayelsa State, Nigeria. *Nigerian Journal of Management Sciences 23* (1) 129 -137

Ikya, E. A., Akaa, S. T., and Ucherwuhe, S. I. (2017). Internal Revenue Generation and Economic Development in Local Government Areas in Nigeria. *Imperial Journal of Interdisciplinary Research, 3*(5), 782-786

IMF (2018). Mobilizing Tax Revenues in Nigeria International Monetary Fund Country Report No. 18/64

Ine-Tonbarapa M.M., Ogullah, S. B., and Abolo, A.P. (2022). Electronic Tax System and Tax Revenue Efficiency in Nigeria 2008 -2021. Advanced Journal of Accounting, Management and Marketing Research 9(9) 82-103

Irefe-Esema, J., and Akinmade, B. (2020). Automation and Tax Compliance: Empirical Evidence from Nigeria. *American Journal of Theoretical and Applied Business*. Special Issue: *Future High-Tech Applications in Human Life*. *8*(Si), 112-133.

Jananga, O.H., Jared, B. and Ong'iyo, C. (2018). Influence of Automation on Revenue Collection by County Government: A Case Study of Nakuru County Government. *International Journal of Economics, Commerce and Management 6* (9), 230-245

John-Akamelu, C.R., and Iyidiobi, F. C. (2019). Effect of e-Taxation on Revenue Generation in Anambra State. *International Journal of Trend in Scientific Research and Development*, *3*(3), 1624-1633

Kendrick M. S. (1939). Ability-to-Pay Theory of Taxation. *The American Economic Review,* 29(1),92-101

Linden, A. (2015). Conducting interrupted time-series analysis for single- and multiple-group comparisons. The Stata Journal 15, (2), 480–500.

Lindsay, I K. (2010). Benefits Theories of Tax Fairness. *The Review of Economic Studies* 175 (15) 210 - 231

Madegwa, B. L., Makokha, E. N., and Namusonge, G. (2018). Effects of Automation of Revenue Collection on the Performance of County Government: A Case Study of Trans Nzoia, County Government Kenya. *European Journal of Business and Mgt, 10* (11), 118 -124

Mbah, A.N., and Onuora, J. K. J. (2018). Effect of Internally Generated Revenue on Infrastructural Development of Southeast States of Nigeria. *International Journal of Economics and Business Management*, *4* (7):1-10

Mullins, P., Gupta, S., and Liu, J. (2020). Domestic Revenue Mobilization in Low-Income Countries: Where to From Here? CGD Policy Paper 195. Washington, DC: Center for Global Development.

Musgrave, R., A. and Musgrave, P. B. (1989). *Public finance in theory and practice* (5th ed). New York: Mcgraw-Hill Book Co.

National Bureau of Statistics, (2020). Statistical Bulletin-Public Finance Statistics-Final. https://nigerianstat.gov.ng/elibrary

National Population Commission (2016).

Nnubia, I.C., Okafor, G.O., Chukwunwike, O. D., Asogwa, O. S., and Ogan, R. J. (2020). Effect of e-Taxation on Revenue Generation in Nigeria a Pre-Post Analysis. A Pre-Post Analysis. *Academy of entrepreneurship Journal,* 26(3), 1-19.

Nto, P. O. O. (2016). Assessment of Risk in the Internally Generated Revenue (IGR) Structure of Abia, Nigeria. *Canadian Social science, 12*(3)

Nwala, M. N., and Gimba, J.T. (2019). Effect of Tax Reforms on Revenue Generation in Nigeria. *Fountain University Osogbo Journal of Management, 4*(3), 198 – 214

Nwamgbebu, O., Oketa, C., Odom, A., Nwambe, C., and Nweke–Charles, U. E. (2019). Electronic Tax System as a Panacea for Tax Revenue Leakages in Nigeria. *African Journal of Politics and Administrative Studies, 12*(1),40-50

Obi, C.K., and Ifelunini, I. (2019). Mobilization of Domestic Resources for Economic Development Financing In Nigeria: Does Tax Matter. *Journal of Development Studies 73*(10),44-58

Ofurum, C. N., Amaefule, L. I., Okonya B. E., and Amaefule, C. A. (2018). Impact of e–Taxation on Nigeria's Revenue and Economic Growth: A Pre – Post Analysis. *International Journal of Finance and Accounting*, *7*(2), 19-26.

Okeke, M. I., Mba, C., and Eme, O. I. (2018) Enhancing Internally Generated Revenue: Issues, Strategies, Foresight and Insights. *Journal of Humanities and Cultural Science*, *2* (1), 1-22

Okoye, P. V., and Ezejiofor, R. (2014). Impact of E-Taxation on Revenue Generation in Enugu, Nigeria. *International Journal of Advance Research*, *2*(2), 449-458.

Oladele, R., Aribaba, F.O., Adediran, R.A., & Babatunde, A.D. (2020). E-tax administration and tax compliance among corporate taxpayers in Nigeria. *Accounting and Taxation Review*, 4(3), 93-101.

Olurankinse, F., and Oladeji O. E. (2019). Self-Assessment, Electronic-Taxation Payment System and Revenue Generation in Nigeria. *Accounting & Taxation Review*, *2*(1), 121 - 137

Onodugo, I C., Onodugo, V., Amujiri, B. A., Asogwa, S. N., & Anyadike, N. (2015) Improving Internally Generated Revenue of South-Eastern States of Nigeria: An Empirical Review of Abia State. *International Journal of Research in Finance and Marketing, 5*(9), 99-118.

Onuselogu, E. C., and Onuora, J.K.J. (2021). Effect of E-Tax Payment on Revenue Generation in Nigeria. *International Journal of Innovative Finance and Economics Research 9*(2), 42-51

Otekunrin, A.O., Nwanji, T. I., Eluyela, D.F., Inegbedion, H., and Eleda, T. (2021). E-tax system effectiveness in reducing tax evasion in Nigeria. *Problems and Perspectives in Management, 19*(4), 175-185.

Oti, P.A., and Odeh, F.I. (2017). Analysis of Internally Generated Revenue and Capital Expenditure Utilization. *International Journal of Development and Economic Sustainability, 1*(2), 9-19.

Ovunda, S.A. (2018). Burning Issues in the Nigerian Tax System and Tax Reforms on Revenue Generation: Evidence from Rivers State, Nigeria. *International Journal of Finance and Accounting*, *7*(2), 36-48

Pricewater House Cooper, (2021). The making of a good e – tax system – www.pwc com/ng

Toluwanimi, S. (2019). The Subnational Political Resource Curse: Allocations, Internally Generated Revenue and Spending Priorities in Nigeria. CSAE Working Paper.

Uduji, J.I., Okolo-Obasi, E.N. and Asongu, S.A. (2018). Does CSR Contribute to the Development of Rural Young People in Cultural Tourism of sub-Saharan Africa? Evidence from the Niger Delta in Nigeria. *Journal of Tourism and Cultural Change,*

Uduji, J.I., Okolo-Obasi, E.N. and Asongu, S. A. (2019). Electronic wallet technology and the enabling environment of smallholder farmers in Nigeria. *Agricultural Finance Review,* 79 (5): 666-688.

United Nations Economic Commission for Africa. (2016). Domestic Resource Mobilization in Africa: A Focus on Government Revenue. Inter-Agency Task Force on Financing for Development Issue Brief

Wawire, N H. W. (2020). Constraints to Enhanced Revenue Mobilization and Spending Quality in Kenya. CGD Policy Paper 163. Washington, DC: Center for Global Development.

Wisdom, D., Ajayi, E., Akindayo, O., Yanah, Y., Kwaido, M., and Shehu S. A. (2020). An Efficient Automated Revenue Generation Database Management System. *Anale. Seria Informatică Computer Science Series, 18*(2), 121-134.